

## AMENDMENTS TO THE CLAIMS

1. (Amended) An assistant for digesting a lignocellulose material, which comprises a combination of:

(I) a nonionic surfactant (A) comprising one or more compounds represented by the general formula (1):



wherein  $R^1$  is a branched alkyl group containing 4-24 carbon atoms represented by the general formula (2):



(wherein  $R^2$  and  $R^3$  are independently selected from the group consisting of straight-chain or branched alkyl groups containing 1-21 carbon atoms, and  $R^4$  is an alkylene group containing 1-21 carbon atoms);  $m$  is an integer of at least 1, having an average of 4-20;  $A^1$  is an alkylene group containing 3 or 4-carbon atoms; and  $n$  is 0 or an integer of at least 1, having an average of 0-15; wherein  $(C_2H_4O)$  and  $(A^1O)$ , in case of the average of  $n$  being 1-15, are linked random-wise and/or block-wise; with

(II) at least one selected from the group consisting of a quinone type digestion assistant and a polysulfide.

2. (Amended) An assistant for digesting for a lignocellulose material, which comprises a combination of:

(I) a nonionic surfactant (B) obtained by addition of an alkylene oxide to an aliphatic alcohol, said nonionic surfactant (B) comprising one or more compounds represented by the general formula (3):



wherein  $R^5$  is a straight-chain, branched or cyclic aliphatic hydrocarbyl group containing 4-24 carbon atoms;  $p$  is an addition molar number of 4-20;  $A^2$  is an alkylene group containing 3 or 4 carbon atoms; and  $q$  is an addition molar number of 0 or 1-15; wherein  $(C_2H_4O)$  and  $(A^1O)$ , in case of the average of  $q$  being 1-15, are linked random-wise and/or block-wise; said nonionic surfactant (B) having a weight-average molecular weight ( $M_w$ ) and a number-average molecular weight ( $M_n$ ) providing a ratio of  $M_w/M_n$  satisfying the relationship

$$M_w/M_n \leq -0.183 \times K^{-0.930} \times \ln X + 1.327 \times K^{-0.065} \quad (4)$$

wherein  $\ln X$  is a natural logarithm of  $X$ ;  $X$  is an average addition molar number of the alkylene oxide per 1 mole of the aliphatic alcohol; and  $K$  is the number of carbon atoms in  $R^5$  of the general formula (3); with

(II) at least one selected from the group consisting of a quinone type digestion assistant and a polysulfide.

3. (Amended) The assistant of Caime 1 [or 2], wherein said nonionic surfactant (A) [or said nonionic surfactant (B)] has an HLB of 6-18.

4. (Amended) An assistant for digesting a lignocellulose material, which comprises a combination of:

(I) at least one anionic surfactant selected from the group consisting of an anionic surfactant (C) represented by the general formula (5) and [and/or] an anionic surfactant (D) comprising one or more compounds represented by the general formula (6):





wherein R<sup>6</sup> is a straight-chain, branched or cyclic aliphatic hydrocarbyl group containing 4-24 carbon atoms; A<sup>3</sup> is an alkylene group containing 3 or 4 carbon atoms; r is 0 or an integer of at least 1, having an average of 0-15; k is an integer of 1 or 2; and M<sup>1</sup> and M<sup>2</sup> are monovalent cations; with

(II) at least one selected from the group consisting of a quinone type digestion assistant and a polysulfide.

5. (Amended) An assistant for digesting a lignocellulose material, which comprises:

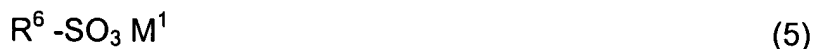
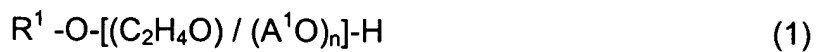
(a) at least one nonionic surfactant selected from the group consisting of a nonionic surfactant (A) and [and/or] a nonionic surfactant (B) ; together with

(b) at least one anionic surfactant selected from the group consisting of an anionic surfactant (C), an anionic surfactant (D) and anionic surfactant (E);

in a weight ratio of 100/0.1 - 100/30;

said nonionic surfactant (A) comprising one or more compounds represented by the general formula (1); said nonionic surfactant (B) being obtained by addition of an alkylene oxide to an aliphatic alcohol and comprising one or more compounds represented by the general formula (3) and having a weight-average molecular weight (Mw) and a number-average molecular weight (Mn) providing a ratio of Mw/Mn satisfying the relationship (4); said anionic surfactant (C) comprising one or more compounds represented by the general formula (5); said anionic surfactant (D)

comprising one or more compounds represented by the general formula (6); and said anionic surfactant (E) comprising one or more compounds represented by the general formula (7):



wherein  $R^1$  is a branched alkyl group containing 4-24 carbon atoms represented by the general formula (2):



(wherein  $R^2$  and  $R^3$  are independently selected from the group consisting of straight-chain or branched alkyl groups containing 1-21 carbon atoms, and  $R^4$  is an alkylene group containing 1-21 carbon atoms),  $R^5$  and  $R^6$  are straight-chain, branched or cyclic aliphatic hydrocarbyl groups containing 4-24 carbon atoms;  $R^7$  is a straight-chain or branched alkyl group, alkenyl group, or mono- or di-hydroxyalkyl group, containing 4-24 carbon atoms;  $R^8$  is an alkylene group containing 1-6 carbon atoms; m is an integer of at least 1, having an average of 4-20; p is a number of 4-20;  $A^1$ ,  $A^2$ ,  $A^3$  and  $A^4$  are alkylene groups containing 3 or 4 carbon atoms; n, r and s are 0 or an integer, of at least 1, having an average of 0-15; q is an addition molar number of 0 or 1-15; k is an

integer of 1 or 2;  $M^1$ ,  $M^2$  and  $M^3$  monovalent cations; wherein  $(C_2H_4O)$  and  $(A^1O)$ , in case of the average of  $n$  or  $q$  being 1-15, are linked random-wise and/or block-wise;

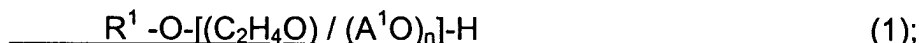
$$Mw/Mn \leq -0.183xK^{-0.930} \times LnX + 1.327xK^{-0.065} \quad (4)$$

wherein  $LnX$  is a natural logarithm of  $X$ ;  $X$  is an average addition molar number of the alkylene oxide per 1 mole of the aliphatic alcohol; and  $K$  is the number of carbon atoms in  $R^5$  of the general formula (3).

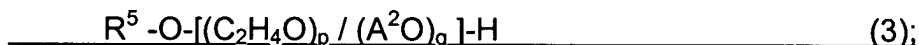
6. (Amended) The assistant of [any one of Claims 1-5] Claim 5, which is used in combination with at least one selected from the group consisting of a quinone type digestion assistant and [and/or] a polysulfide.

7. (Amended) A method for producing a pulp, which comprises digesting a lignocellulose material with an alkali or a sulfite in the presence of a digestion assistant; [wherein an] said assistant comprising at least one assistant (I) [(a) according to any one of Claims 1-6 is used as the assistant] selected from the group consisting of:

(A) a nonionic surfactant comprising one or more compounds represented by the general formula (1):



(B) a nonionic surfactant, obtained by addition of an alkylene oxide to an aliphatic alcohol, comprising one or more compounds represented by the general formula (3):



and having a weight-average molecular weight (Mw) and a number-average molecular weight (Mn) providing a ratio of Mw/Mn satisfying the relationship (4):

$$Mw/Mn \leq -0.183xK^{-0.930} \times LnX + 1.327xK^{-0.065} \quad (4);$$

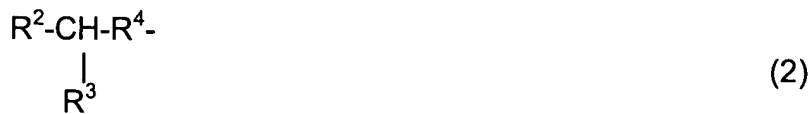
(C) an anionic surfactant comprising one or more compounds represented by the general formula (5):



(D) an anionic surfactant comprising one or more compounds represented by the general formula (6):



wherein R<sup>1</sup> is a branched alkyl group containing 4-24 carbon atoms represented by the general formula (2):



wherein R<sup>2</sup> and R<sup>3</sup> are independently selected from the group consisting of straight-chain or branched alkyl groups containing 1-21 carbon atoms, and R<sup>4</sup> is an alkylene group containing 1-21 carbon atoms); R<sup>5</sup> and R<sup>6</sup> are straight-chain, branched or cyclic aliphatic hydrocarbyl groups containing 4-24 carbon atoms; m is an integer of at least 1, having an average of 4-20; p is a number of 4-20; A<sup>1</sup>, A<sup>2</sup> and A<sup>3</sup> are alkylene groups containing 3 or 4 carbon atoms; n and r are 0 or an integer of at least 1, having an average of 0-15; q is an addition molar number of 0 or 1-15; k is an integer of 1 or 2; M<sup>1</sup> and M<sup>2</sup> are monovalent cations wherein (C<sub>2</sub>H<sub>4</sub>O) and (A<sup>1</sup>O), in case of the average of n or q being 1-15, are linked random-wise and/or block-wise; LnX is a natural logarithm of X; X is an average addition molar number or the alkylene oxide per 1 mode of the aliphatic alcohol; and K is the number of carbon atoms in R<sup>5</sup> of the general formula (3).

8. (Amended) The [A] method [for producing a pulp, which comprises digesting a lignocellulose material with an alkali or a sulfite in the presence of a digestion assistant] of Claim 7; wherein said [an] assistant (I) [(a) according to any one of Claims 1-5] is used together with at least one component (II) selected from the group consisting of a quinone type digestion assistant and [and/or] a polysulfide [as the assistant].

9. (Amended) The method of Claim 8, wherein the assistant (I) [(a)] is added beforehand prior to addition of the quinone type digestion assistant and/or the polysulfide, and after their addition, digesting is carried out.

10. (Amended) The method of Claim 9, wherein the lignocellulose material is heated after, during and/or before addition of the assistant (I) [(a)].